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Condom-associated erection problems: behavioural responses and attributions in young, heterosexual men

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Abstract. ***Background*:** Previous studies have associated men who experience condom-associated erection problems (CAEP) with incomplete condom use and/or foregoing using condoms altogether. However, how men respond to CAEP and what they attribute CAEP to, remains unclear. Understanding young men's CAEP responses and attributions could help improve sexually transmissible infections (STI)/HIV prevention programs and interventions. ***Methods*:** Behavioural responses to, and attributions for, CAEP during application (CAEP-Application) and/or during penile-vaginal intercourse (CAEP-PVI) were reported using an online questionnaire by 295 young, heterosexual men (aged 18–24 years) who were recruited via social media websites and university Listservs across major cities in the Midwestern USA. ***Results*:** Behavioural responses to CAEP-Application included receiving oral or manual stimulation, stimulating a partner, self-stimulation, foregoing condom use and applying the condom after starting intercourse. Attributions for CAEP-Application included: distraction, fit and feel problems, application taking too long and having consumed too much alcohol. Behavioural responses to CAEP-PVI included increasing the intensity of intercourse, removing the condom to receive oral or manual stimulation and removing condom and continuing intercourse. Attributions for CAEP-PVI included: lack of sensation, taking too long to orgasm, not being 'turned on' enough, fit and feel problems and partner-related factors. ***Conclusions*:** Men who report CAEP respond with both STI/HIV risk-reducing and potentially risk-increasing behaviours (e.g. forgoing condom use). Men attribute their experiences to a wide range of individual- and partner-level factors. Addressing men's CAEP behavioural responses and attributions may increase the efficacious value of condom programs and STI/HIV prevention interventions – particularly among men who experience CAEP.

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Introduction

Condom-associated erection problems (CAEP) are common and attenuate condom effectiveness in preventing sexually transmissible infections (STIs), including HIV, and unplanned pregnancy.[1,2] Studies have found that between 14% and 28% of male participants experience erection loss during condom application and 10–20% experience erection loss during intercourse while using a condom.[1] A study of young men attending a public STI clinic found 37% of men reported CAEP (during application, during intercourse or both) occurring at least one of the last three times they used a condom.[3] In a study of college-aged young men, CAEP was reported by 25–32% of the sample reporting on the previous 3 months.[4] CAEP has been found to be associated with more frequent unprotected vaginal intercourse,[3] less consistent condom use,[3] condom slippage,[5,6] greater likelihood of removing condoms before sex is over (incomplete use),[3,7] more problems with 'fit or feel' of condoms[8] and lower self-efficacy to use condoms correctly.[3]

The potential relationship between CAEP and STI and HIV prevention is becoming clear. In a recent study by Graham *et al.* (2014) among young, Black men in the Southern United States (US), who are at high risk for contracting STIs, 18% reported

CAEP occurring at least once within the past 2 months.[9] Multivariate analyses identified that CAEP was associated with sex with more than one partner, problems with fit and feel, lower motivations to use condoms and attempts to put a condom on before having a full erection.[9] Similarly, Crosby *et al.* (2012) found that CAEP was the most frequently reported problem among both adolescent (15–19 years) and young adult (20–24 years) condom-using men. These findings are particularly concerning considering that early and repeated experiences of CAEP may lead young men to abandon condoms altogether.[10] Understanding men's behaviours when they experience CAEP, and what they attribute their erection loss to, has implications for improved condom education interventions and STI/HIV prevention. The current study helps address this gap in the condom research and STI/HIV prevention literature.

The purpose of the current study is to examine young, heterosexual men's behavioural responses and attributions to two forms of CAEP: (1) CAEP during condom application (CAEP-Application); and (2) CAEP while wearing a condom during penile-vaginal intercourse (CAEP-PVI). Additionally, the study examines the influence of experiencing CAEP-Application and CAEP-PVI occasionally vs frequently on young men's behavioural responses to, and attributions for, CAEP.

Methods

Participants

For the purpose of current study, a convenience sample of young, self-identified heterosexual men were recruited using electronic flyers on Facebook, with geo-targeted advertising in several major Midwest US cities including: Chicago, Illinois; Indianapolis, Indiana; Louisville, Kentucky; Detroit/Ann Arbor, Michigan; and Cincinnati, Ohio. Electronic recruitment flyers were presented on the Facebook pages of users who identified as male and listed the geo-targeted cities as their current city of residence using standard Facebook electronic banner advertising guidelines and procedures. Additionally, email advertisements were distributed on university Listservs (e.g. university student groups and department listings). An online questionnaire screened for eligibility using the following inclusion criteria: (1) identifying as a heterosexual man; (2) being between the ages of 18 and 24 years; (3) having used a condom for penile-vaginal intercourse (PVI) with a woman within the past 90 days; (4) being able to read and write in English; and (5) having access to the Internet. Men were not eligible for the study if they were currently living with a partner, were married or if they indicated they had been sexually exclusive for more than 30 days, as condom use has been found to decrease after the first month of a committed relationship.[11] For the purpose of this study, men reporting CAEP were oversampled using targeted advertising specifically seeking men who had previously experienced problems using condoms or erection problems while using condoms to participate in a questionnaire study. Data was collected from participants from August 2010 through to August 2012 as part of an ongoing 2-year study that recruited eligible men to a separate laboratory condom use study.[2,12,13] Participants were offered $10 compensation for completing the 45–60 min online questionnaire. The current article focuses on the data collected from the 295 men who reported CAEP (as defined below) from the total sample of 479 who completed the questionnaire.[2]

Measures

Men who completed the screening questionnaire and met eligibility criteria were directed to the full online questionnaire. A consent statement preceded the questionnaire. Upon electronic consent, participants were asked to complete a questionnaire that consisted of sociodemographic questions including: age, education, hometown size, racial/ethnic background and current income. Participants were then asked questions about CAEP frequency and experiences.

Condom-associated erection problems (CAEP)

Participants were asked two specific CAEP-related questions using a 90-day recall period: (1) 'How often over the PAST 90 DAYS did you lose or start to lose your erection while PUTTING THE CONDOM ON before vaginal intercourse?' (defined as, CAEP-Application); and (2) 'IN THE PAST 90 DAYS, how often did you lose or start to lose your erection WHILE WEARING A CONDOM DURING vaginal intercourse?' (defined as, CAEP-PVI). A 90-day recall period was used as it has been shown to produce the most reliable data relating to sexual behaviours.[14] Response options for both questions were: 1-never, 2-occasionaly, 3-less than half the time, 4-most of the time, 5-always. CAEP items were dichotomised 'yes' when men indicated at least '2-occasionally' experiencing CAEP-Application or CAEP-PVI and 'no' when men indicated '1-never'.

For CAEP subgroup comparisons, men reporting experiencing 'occasional' CAEP-Application or CAEP-PVI were compared with those reporting more 'frequent' CAEP. 'Frequent' CAEP was defined as reporting CAEP-Application or CAEP-PVI 'most of the time' or 'always'. 'Occasional' CAEP-Application or CAEP-PVI was defined as reporting only CAEP 'occasionally' or 'less than half the time'.

CAEP-application behavioural responses and attributions

Behavioural responses for CAEP-Application were measured using the stem question, 'During the PAST 90 DAYS when you had erection problems while putting the condom on, what did you do?' followed by 10 behavioural items including: (1) waited until my erection was harder and then tried putting a condom on; (2) had my partner put the condom on my penis; (3) started intercourse without the condom and put the condom on later; (4) had intercourse without a condom; (5) stimulated or touched myself; (6) my partner stimulated me with her fingers; (7) my partner stimulated me with her mouth; (8) tried a different condom; (9) tried adding lubricant first; and (10) I stimulated her for a while. Response options for all items included '1-yes' or '0-no'.

Attributions for CAEP-Application were measured using the stem question, 'During the PAST 90 DAYS, in general why do you think you had erection problems while putting on a condom?' followed by 16 attributions items including: (1) I have erection problems whether or not I am using a condom; (2) erection was weak even before I started to put the condom on; (3) I was worried because in the past I have lost my erection when

using a condom; (4) putting the condom on took too long; (5) putting the condom on was too much of a distraction from the sexual situation; (6) I or my partner made mistakes trying to put it on; (7) my partner didn't want to use the condom; (8) the condom made me think of disease; (9) wearing condoms makes me feel less attractive; (10) I don't like the smell of condoms; (11) I don't like the feel of condoms; (12) the condom was too small; (13) the condom was too big; (14) the condom didn't fit; (15) I had too much alcohol; and (16) I used drugs or medications. Response options included: 1-not a reason/not important, 2-somewhat important reason, 3-important reason and 4-very important reason. Attributions were dichotomised and recoded as 'yes, important reason' when men indicated '2-somewhat important reason', '3-important reason' or '4-very important reason'; and 'not important' for men indicating '1-not a reason/not important'.

CAEP-PVI behavioural responses and attributions

The CAEP-PVI behavioural responses were measured using the stem question, 'During the PAST 90 DAYS when you had erection problems WHILE WEARING A CONDOM DURING vaginal intercourse, what did you do?' followed by a list of 15 behavioural responses including: (1) increased the intensity of intercourse to get more stimulation; (2) kept the condom on and she performed oral sex on me; (3) kept the condom on and she stimulated my penis with her fingers; (4) kept the condom on and tried anal sex (penis in anus/rectum/butt); (5) kept the condom on and rubbed my penis elsewhere on her body; (6) took the condom off and continued having vaginal intercourse without a condom; (7) took the condom off and she performed oral sex on me; (8) took the condom off and she stimulated my penis with her fingers; (9) took the condom off and tried anal sex (penis in anus/rectum/butt); (10) took the condom off and rubbed my penis elsewhere on her body; (11) gave up on vaginal intercourse; (12) I added a lubricant; (13) I took an erection-enhancing drug; (14) used porn or fantasy; and (15) had partner say stimulating things. Response options for all items included '1-yes' or '0-no'.

The CAEP-PVI attributions were measured using the stem question, 'During the PAST 90 DAYS, in general why do you think you had erection problems WHILE WEARING A CONDOM DURING vaginal intercourse?' followed by 23 attribution items including: (1) I have erection problems whether or not I am using a condom; (2) erection was weak when I applied the condom and decreased during intercourse; (3) I just wasn't turned on enough; (4) I was worried because in the past I have lost my erection when using a condom; (5) it was taking too long to cum (orgasm/ejaculate); (6) not enough sensation through the condom; (7) condom was irritating my penis; (8) condom was too small; (9) condom was too big; (10) condom didn't fit; (11) condom didn't feel right; (12) condom broke; (13) condom started slipping off and that decreased my erection; (14) my partner's vagina was too dry; (15) my partner's vagina was too wet; (16) my partner's vagina was too tight; (17) my partner's vagina was too loose; (18) my partner was having pain/discomfort; (19) my partner didn't seem into it; (20) my partner said she didn't like the condom; (21) we were interrupted by someone/something; (22) I had too much alcohol; and (23) I used drugs or medications. Response options included: 1-not a reason/not important, 2-somewhat important reason, 3-important reason and 4-very important reason. Attributions were dichotomised and recoded as 'yes, important reason' when men indicated '2-somewhat important reason', '3-important reason' or '4-very important reason'; and 'not important' for men indicating '1-not a reason/not important'.

All study protocols, procedures and questionnaires were approved by the Indiana University Institutional Review Board.

Data analysis

All data were entered into a statistical analysis software package for analysis (IBM Corp., Released 2011; IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY, USA). Descriptive statistics were used to describe the characteristics of the sample, behavioural responses to CAEP-Application and CAEP-PVI, and attributions for CAEP-Application and CAEP-PVI. Independent group *t*-tests were used to compare age, frequency of PVI and frequency of condom use from men reporting 'frequent CAEP' to those reporting 'occasional CAEP' for each type of CAEP. Chi-squared tests using Yate's correction for continuity were used to compare answers from men reporting 'frequent' to those reporting 'occasional' CAEP of each type for response behaviours and attributions. The Yate's correction was applied to prevent the over estimation of statistical significance for comparisons among a small sample size.[15]

Results

Participant characteristics

Of the 295 participants who reported experiencing at least one type of CAEP, CAEP-Application was reported by 220 men and CAEP-PVI by 229 men (154 men, or 52% of the sample, reported both types of CAEP). The mean age was 20.5 years. The majority identified as White (84.4%) and 55.6% having a mean income that was considered lower-middle or less (Table 1). Just over half of the men (54.9%) indicated reliance on condoms as their only form of birth control at least some of the time. The majority (60.4%) had more than one female sex partner in the past 90 days, reported being single (98.0%) and were in a non-exclusive/non-monogamous sexual relationship (89.6%).

CAEP-application behavioural responses and attributions

As is shown in Table 2, a large proportion of the 220 men reporting CAEP-Application indicated that they had their partner stimulate them with her mouth or fingers, or stimulated themselves or their partner when they experienced erection problems while putting on a condom. The majority also reported waiting until their penis was harder before trying to put on a condom. A smaller yet substantial proportion of men reported having intercourse without a condom or starting intercourse without a condom and putting the condom on later.

For attributions or why they believed they lost their erections during application (Table 2), almost two-thirds of the men cited condom application as too much of a distraction from the sexual situation. More than half indicated they did not like the feel of

Table 1. Sociodemographic characteristics ($n = 295$)

	% Yes
Mean age (years; standard deviation)	20.5 (1.6)
Race/ethnicity	
American Indian/Alaska Native	2.4
Asian	8.5
Black or African American	5.4
Native Hawaiian or other Pacific Islander	1.4
White	84.4
Multiracial	3.7
Education	
Did not complete high school	0.3
Completed high school	26.8
Completed college/technical school	69.5
Completed an advanced degree	3.4
Current income	
Poverty level	16.3
Lower income	29.5
Lower-middle income	9.8
Middle income	21.7
Upper-middle income	11.2
Upper income	2.0
I choose not to answer	9.5

condoms, that it took too long to put the condom on, or cited too much alcohol as a contributing factor to their erection loss. More than one-third of the men attributed their erection loss to worry because they lost their erection when using a condom in the past, their erection was weak even before they started putting the condom on, the condom didn't fit or was too small or they didn't like the smell of condoms.

Combining all three attributions regarding fit (too small, too large, didn't fit), nearly half of the men (49.8%) attributed at least one of these to experiencing CAEP-Application. Less than one-third of the participants indicated that they or their partner made mistakes when trying to put on a condom, which contributed to CAEP-Application. Approximately one in five indicated that their female partner didn't want to use the condom or that wearing a condom made them feel less attractive.

CAEP-PVI behavioural responses and attributions

Of the 229 men reporting CAEP-PVI, ~80% reported increasing the intensity of intercourse to get more stimulation in response to erection loss while wearing a condom (Table 2). More than half reported removing the condom to have their partner perform oral sex or manual stimulation. Roughly 40% of men reported taking the condom off and continuing to have vaginal intercourse without a condom. Almost one-third gave up on intercourse, while roughly 10% said they took the condom off and tried anal intercourse.

More than three-quarters of men reporting CAEP-PVI attributed their erection loss to insufficient sensation through the condom. More than half reported it was taking too long to orgasm or that they were just not turned on enough. Roughly half of the men attributed CAEP-PVI to too much alcohol, worrying because in the past they have lost erections while using a condom, their erections were weak when the condom was applied and decreased during PVI or that the condom didn't feel right. Almost one-third reported that their partner's vagina was too dry, their partner didn't like the condom, the condom was too small, the condom was irritating their penis, the condom didn't fit or their partner was experiencing pain or discomfort as reasons for CAEP-PVI.

Combining all attributions regarding condom fit (too small, too large, didn't fit), 40.4% of the men attributed at least one of these to their experience of CAEP during PVI. Combining the seven attributions related to their sexual partner(s), a large majority (71.1%) of men attributed partner variables to their experience of CAEP-PVI.

CAEP-application frequency group comparisons

Of the 220 men who reported CAEP-Application, 193 (87.7%) reported experiencing 'occasional' (those reporting 'occasionally or 'less than half the time') CAEP-Application in the past 90 days. These men were compared with the remaining 27 (12.3%) men who reported experiencing 'frequent' CAEP-Application (those reporting 'most of the time' or 'always'). There were no significant differences between the two groups in terms of age (mean (M) = 20 years vs M = 20 years, $P = 0.98$), frequency of penile-vaginal intercourse (M = 17.3 vs M = 13.0, $P = 0.27$) or the frequency or rate of condom use for PVI (M = 12.3 vs M = 8.7, $P = 0.25$).

Comparative analyses of behavioural responses to CAEP-Application highlighted three significant group differences. Men experiencing 'frequent' CAEP-Application were significantly more likely to report waiting until their erection was harder, then trying to put a condom on (88.9% vs 64.6%, $\chi^2 = 6.38$, $P = 0.01$), starting intercourse without a condom then putting it on later [51.9% ([95% confidence interval (CI)] = ± 6.6] vs 28.1% (± 5.94), $\chi^2 = 6.22$, $P = 0.01$] and having had intercourse without a condom [59.3% (± 6.49) vs 35.9% (± 6.34), $\chi^2 = 5.42$, $P = 0.02$], compared with men reporting only 'occasional' CAEP-Application. Men reporting 'frequent' CAEP-Application were significantly more likely to attribute their experience of CAEP-Application to: worrying because in the past they had lost their erections when applying a condom [81.5% (± 5.13) vs 38.3% (± 6.42), $\chi^2 = 17.92$, $P < 0.001$], not liking the feel of condoms [80.8% (± 5.2) vs 54.5% (± 6.58), $\chi^2 = 6.46$, $P = 0.01$], not liking the fit of condoms [63.0% (± 6.38) vs 37.5% (± 6.40), $\chi^2 = 6.36$, $P = 0.01$], wearing condoms made them feel less attractive [37.0% (± 6.38) vs 18.7% (± 5.15), $\chi^2 = 4.84$, $P = 0.03$] and condoms made them think of disease [18.5% (± 5.13) vs 5.2% (± 5.20), $\chi^2 = 6.63$, $P = 0.05$].

CAEP-PVI frequency group comparisons

Of the 229 men included in the analysis for CAEP-PVI, 206 (90.0%) indicated they only experienced 'occasional' CAEP-PVI (those reporting 'occasionally' or 'less than half the time') in the past 90 days. These men were compared with the remaining 23 (10.0%) men who indicated more 'frequent' CAEP-PVI (those reporting 'most of the time' or 'always experiencing CAEP-PVI'). There were no significant group differences in terms of age (M = 20 years vs M = 20 years, $P = 0.66$), frequency of penile-vaginal intercourse (M = 17.9 vs M = 13.2, $P = 0.30$) or the frequency or rate of condom use for PVI (M = 12.8 vs M = 7.9, $P = 0.18$).

Table 2. Percentages indicating various behavioural responses to, and attributions for, condom-associated erection problems (CAEP)-Application and CAEP-penile-vaginal intercourse (PVI)

	% Yes 'Important' (95% confidence interval)
CAEP-Application (*n* = *220*)	
Behavioural responses	
My partner stimulated me with her mouth	78.5 (73.1–83.9)
My partner stimulated me with her fingers	77.6 (72.1–83.1)
I stimulated her for a while	77.2 (71.7–82.7)
Stimulated or touched myself	70.8 (64.8–76.8)
Waited until my erection was harder and then tried putting a condom on	67.6 (61.4–73.8)
Had intercourse without a condom	38.8 (32.4–45.2)
Started intercourse without the condom and put the condom on later	31.1 (25.0–37.2)
Had my partner put the condom on my penis	26.0 (20.2–31.8)
Tried adding lubricant first	19.3 (14.1–24.5)
Tried a different condom	17.4 (12.4–22.4)
Attributions	
Putting condom on was too much of a distraction from the sexual situation	72.6 (66.7–78.5)
Don't like the feel of condoms	57.7 (51.2–64.2)
Took too long to put the condom on	55.5 (48.9–62.1)
Too much alcohol	53.4 (46.8–60.0)
Worrying because in the past I have lost my erection when using a condom	43.6 (37.1–50.2)
Erection was weak even before I started to put the condom on	40.9 (34.4–47.4)
The condom didn't fit	40.6 (34.1–47.1)
The condom was too small	38.2 (31.8–44.6)
Don't like the smell of condoms	33.6 (27.4–39.8)
I or my partner made mistakes trying to put it [condom] on	28.6 (22.6–34.6)
My partner didn't want to use the condom	21.9 (16.4–27.4)
Wearing condoms makes me feel less attractive	20.9 (15.5–26.3)
Drugs or medication	14.5 (9.9–19.2)
I have erection problems whether or not I am using a condom	12.3 (8.0–16.6)
The condom was too big	12.3 (8.0–16.6)
The condom made me think of disease	6.8 (3.5–10.1)
CAEP-PVI (*n* = *229*)	
Behavioural responses	
Increased the intensity of intercourse to get more stimulation	79.9 (74.7–85.1)
Took the condom off and she performed oral sex on me	62.4 (56.1–68.7)
Took the condom off and she stimulated my penis with her fingers	56.1 (49.7–62.5)
Took the condom off and continued having vaginal intercourse without a condom	40.7 (34.3–47.1)
Had my partner say stimulating things	38.8 (32.5–45.1)
Kept the condom on and she stimulated my penis with her fingers	36.4 (30.2–42.6)
Gave up on vaginal intercourse	32.8 (26.7–38.9)
Took the condom off and rubbed my penis elsewhere on her body	26.4 (20.7–32.1)
Kept the condom on and rubbed my penis elsewhere on her body	24.2 (18.7–29.8)
I added a lubricant	23.1 (17.6–28.6)
Used porn or fantasy	20.5 (15.3–25.7)
Kept the condom on and she performed oral sex on me	13.5 (9.1–17.9)
Took the condom off and tried anal sex (penis in anus/rectum/butt)	12.3 (8.1–16.6)
Kept the condom on and tried anal sex (penis in anus/rectum/butt)	7.9 (4.4–11.4)
I took an erection-enhancing drug	2.2 (0.3–4.1)
Attributions	
Not enough sensation through the condom	77.9 (72.5–83.3)
It was taking too long to cum (orgasm/ejaculate)	63.3 (57.1–69.5)
I just wasn't turned on enough	52.2 (45.7–58.7)
Too much alcohol	49.1 (42.6–55.6)
Erection was weak when I applied the condom and decreased during intercourse	46.9 (40.4–53.4)
Worrying because in the past I have lost my erection when using a condom	46.1 (39.6–52.6)
Condom didn't feel right	45.3 (38.9–51.8)
My partner's vagina was too dry	36.4 (30.2–42.6)
My partner said she didn't like the condom	36.4 (30.2–42.6)
Condom was too small	35.2 (29.0–41.4)

(*continued next page*)

Table 2. (*continued*)

	% Yes 'Important' (95% confidence interval)
Condom was irritating my penis	34.6 (28.4–40.8)
Condom didn't fit	34.2 (28.1–40.3)
My partner was having pain/discomfort	32.9 (26.8–39.0)
My partner didn't seem into it	27.6 (21.8–33.4)
We were interrupted by someone/something	25.4 (19.8–31.0)
Condom started slipping off and that decreased my erection	25.0 (19.4–30.6)
Condom broke	18.4 (13.4–23.4)
My partner's vagina was too loose	18.0 (13.0–23.0)
My partner's vagina was too tight	16.2 (11.4–21.0)
I have erection problems whether or not I am using a condom	12.7 (8.41–17.0)
My partner's vagina was too wet	12.3 (8.1–16.6)
Drugs or medication	11.4 (7.3–15.5)
Condom was too big	10.1 (6.2–14.0)

Comparative analyses of behavioural responses to CAEP-PVI highlighted two group differences. Men reporting only 'occasional' CAEP-PVI were significantly more likely to report keeping the condom on while their partner performed oral sex [15.0% (± 4.62) vs 0%, $\chi^2 = 4.00$, $P = 0.05$] and keeping the condom on and rubbing their penis elsewhere on their partner's body [26.5% (± 5.72) vs 4.3% (± 2.63), $\chi^2 = 5.51$, $P = 0.02$], compared with men reporting 'frequent' CAEP-PVI.

As for attributions of their experience of CAEP-PVI, men reporting 'frequent' CAEP-PVI were significantly more likely to select 'worrying because in the past he had lost his erection when using a condom' as the reason for losing their erection [82.0% (± 4.98) vs 42.0% (± 6.39), $\chi^2 = 13.76$, $P < 0.001$], compared with men reporting only 'occasional' CAEP-PVI.

Discussion

This study is, to the best of our knowledge, the first to specifically assess behavioural responses to, and attributions for, erection problems during condom application and use for penile-vaginal intercourse among young, heterosexual men. Building on previous research on condom use errors and problems, the findings from this study provide further insight into CAEP as a possible cause of certain types of condom use errors.[1–4] Such errors include foregoing condom use (38.8%) or applying condoms late after intercourse has begun (31.1%) as reported by men experiencing CAEP during condom application; and increasing intercourse intensity (a risk for condom breakage) (79.9%) and early condom removal followed by unprotected penile-vaginal (40.7%) or anal (12.3%) intercourse, as reported by men experiencing CAEP during PVI. Engaging in these behaviours greatly compromises the protective value of condoms against STIs, HIV and unintended pregnancy.

In contrast, a fair number of behavioural responses to CAEP during application and PVI were encouraging in terms of how they may contribute to safer sex practices. For example, employing several different forms of sexual stimulation (e.g. manual and/or oral partner stimulation, self-stimulation, etc.) may be a common response to erection loss during condom application and could be incorporated into STI/HIV prevention and safer sex education interventions as a means of avoiding engaging in unprotected intercourse. In the current study, approximately one-quarter of the men reported having their partner apply the condom in response to erection loss during application, suggesting that this may be a constructive strategy for dealing with and/or avoiding CAEP during condom application.

Regarding CAEP-PVI, several of the men's behavioural responses provide a sex-positive set of potential intervention strategies that could be incorporated in safer sex program curricula. For example, a large percentage of the men reporting CAEP-PVI found alternative ways to stimulate themselves and their partners without having unprotected PVI. Several other sexual behaviours were engaged in while keeping the condom on (e.g. oral sex, anal sex, rubbing their penis on their partner's body or having their partner stimulate them with a condom on). Some of the stimulation occurred without the condom, but is nonetheless classified as relatively less risky sexual practice (e.g. oral sex, manual stimulation, rubbing with the condom off) than unprotected penile-vaginal or penile-anal intercourse. Interestingly, roughly one-third of the men gave up entirely on PVI as result of CAEP-PVI, rather than engaging in unprotected PVI. This finding suggests that, even during intercourse, highly motivated condom-using men can exercise adequate control to protect themselves and their partners by avoiding intercourse when condom use for PVI is not possible.

The contributing factors that men attributed their experiences of CAEP to suggest several avenues for potential intervention development. Nearly three-quarters of the men reporting CAEP-Application cited condoms being a distraction from the sexual situation; intervention programs may increase efficacy by providing men with clear instructions on when and how condoms can be introduced into their sexual practices.[11,16,17] In addition, such attributions highlight the relevance of teaching correct condom use and suggesting that men practice with condoms to improve application skills.[11,17] Given the high proportion of men who indicated experiencing problems with condom fit and feel, intervention programs could help or encourage men to seek out condoms that optimise their comfort, fit and feel in an effort to minimise or avert CAEP.[2,17]

The most common attribution for CAEP-PVI was lack of sensation and there is growing evidence that lack of sensation with a condom on may play a key role in men's use[12,13] However,

sensation loss may be correctable through the choice of condoms, given that thin condoms and ones with additionally stimulating features are now commonly available. Unfortunately, condoms typically distributed through public health programs do not reflect the full range of possible condom types (e.g. thinner condoms, different shapes, textures, etc.) that might resolve issues such as lack of sensation and possibly associated CAEP.

Experimentation with different types or other condoms (e.g. size, texture) and condom-safe lubricants may be an important addition to current safer sex programs for men experiencing either type of CAEP.[11,17] However, it may be necessary for interventions to help men identify the range of possible condoms currently on the market in addition to finding suitable condom-safe lubricants that do not compromise the structural integrity of condoms (e.g. water-based lubricants, silicon-based lubricants). Thus, condom interventions such as the Kinsey Institute Homework Intervention Strategy (KIHIS)[17,18] may benefit men experiencing CAEP as it attends to some of the most commonly cited CAEP attributions: sensation loss, application distraction, condom fit and feel and condom application skills. KIHIS is a self-guided home-based intervention, which encourages men to practice applying, using and removing a variety of condoms and condom-safe lubricants alone in a 'low-pressure' sexual situation.

Of particular interest is the finding that roughly half of men in our sample cited 'too much alcohol' as a contributing factor for experiencing both types of CAEP. Although alcohol alone may not necessarily be associated with condom use behaviours, alcohol may have an effect on erectile function, thus subsequently affecting the ability to effectively use condoms, particularly given that excessive alcohol consumption has been shown to modify some men's degree of erection (e.g. decreased rigidity or peak circumference).[19,20] Thus, changes in the degree of erection may pose a challenge for men while applying or wearing a condom, as well as compromising the protective value of condoms by increasing the likelihood of breakage or slippage.[20] From an intervention perspective, conveying the message that heavy drinking may interfere with erections when using condoms may be especially warranted for men who experience CAEP.

Seventy-one per cent of men attributed CAEP-PVI to at least one of the seven partner-related variables that were assessed (i.e. partner's vagina was too dry, too wet, too tight or too loose; she was having pain/discomfort; she didn't seem into it; or she said she didn't like the condom). This suggests that men's perceptions of their female partner's experiences during condom use may influence men's ability to retain erection. Furthermore, the findings highlight the need for more detailed and direct assessment of women's experiences during condom use to more fully understand the couple dynamic that may affect condom use practices. It is also possible that men who experience CAEP rush condom application not allowing sufficient time and foreplay for both partners to be adequately aroused for comfortable intercourse using a condom. Previous research found that not taking enough time to apply a condom is associated with CAEP.[20] In the current study, the majority of men attributed CAEP-Application to taking too long to apply condoms and distracting from the sexual situation. Safer sex interventions that include condom application skill development may reduce the time and distraction of condom application, and perhaps suggesting better communication between partners about sexual stimulation and arousal, lubricant use, and condom selection may additionally help.[21]

Compared with men reporting occasional CAEP-Application, men reporting higher frequencies of CAEP-Application indicated a higher propensity for late condom application and having PVI without a condom, and attributed their experiences of CAEP-Application to worry of losing their erection, problems with condom fit and feel, feeling that condoms made them less attractive and that condoms reminded them of disease. Men who reported a higher frequency of CAEP-PVI were less likely to report engaging in alternative, yet protected (e.g. with a condom), sexual behaviours compared with men those men who reported only occasional CAEP-PVI. For example, men reporting only occasional CAEP-PVI indicated that they were likely to respond to their experience of CAEP by engaging in oral sex while wearing a condom and/or rubbing their penis on their partner's body with a condom on. These differences based on the frequency of experiencing CAEP reinforce the importance of addressing CAEP-Application and CAEP-PVI in intervention programs, with a particular focus on the significance of complete condom use, as well as alternative sexual strategies for when men experience erection loss while applying and using condoms.

Limitations

Although the current study highlights several potential strategies to improve safer sex programs, some limitations should be acknowledged. For example, the current study relied on self-reported measures, obtained from a convenience sample of men, using an online survey. Other methodological approaches (e.g. psychophysiological) could be of value and improve our understanding of processes relevant to sexual arousal that may contribute to CAEP. In the current study, only a small proportion of participants reported experiencing CAEP (both Application and during PVI) 'most of the time' or 'always', thus group comparisons examining the relationship between frequency of CAEP-Application and CAEP-PVI relied on a relatively small number of men. Subsequent studies specifically examining the behavioural responses and attributions of men who experience CAEP more frequently, or even every time they use a condom, are needed as these men may be at greater risk for condom use errors and problems, or even discontinue condom use altogether. Additionally, the sample consisted primarily of White, relatively young, heterosexual men. Future studies on CAEP could focus on more diverse samples in terms of ethnicity, age and sexual orientation. Another limitation of the present study is that it focussed on condom use for and during PVI, which does not address the experiences with and impact of CAEP during, for example, oral and anal sex in young, heterosexual men.

Conclusion

Men who experienced CAEP reported responding with both STI/HIV risk-reducing and potentially risk-increasing behaviours. Incomplete use (late application/early condom removal), foregoing condom use and increased intercourse intensity (a risk for condom breakage) greatly compromise the protective

value of condoms against STIs, HIV and unintended pregnancy. However, men also reported engaging in several constructive, sex-positive and low-risk sexual behaviours in response to CAEP. Men attributed their experiences of CAEP to problems with fit and feel, sensation loss, distraction and worry and partner-related variables. Providing possible strategies that address men's behavioural responses to, and perceived contributing attributions for, CAEP may increase the applicability and efficacious value of condom use education programs and interventions – particularly among men who frequently experience erection loss when applying and using condoms.

Conflicts of interest

None declared.

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References

1 Sanders SA, Yarber WL, Kaufman EL, Crosby RA, Graham CA, Milhausen RR. Condom use errors and problems: a global view. *Sex Health* 2012; 9: 81–95. doi:10.1071/SH11095

2 Sanders SA, Hill BJ, Crosby RA, Janssen E. Correlates of condom-associated erection problems in young, heterosexual men: condom fit, self-efficacy, perceptions, and motivations. *AIDS Behav* 2014; 18: 128–34. doi:10.1007/s10461-013-0422-3

3 Graham CA, Crosby RA, Yarber WL, Sanders SA, McBride KR, Milhausen RR, Arno JN. Erection loss in association with condom use among young men attending a public STI clinic: potential correlates and implications for risk behaviour. *Sex Health* 2006; 3: 255–60. doi:10.1071/SH06026

4 Crosby RA, Sanders SA, Yarber WL, Graham CA, Dodge B. Condom use errors and problems among college men. *Sex Transm Dis* 2002; 29: 552–7. doi:10.1097/00007435-200209000-00010

5 Crosby RA, Shrier LA, Charnigo RJ, Weathers C, Sanders SA, Graham CA, Milhausen RR, Yarber WL. A prospective event-level analysis of condom use experiences following STI testing among patients in three US cities. *Sex Transm Dis* 2012; 39: 756–60. doi:10.1097/OLQ.0b013e318265a951

6 Yarber WL, Graham CA, Sanders SA, Crosby RA. Correlates of condom breakage and slippage among university undergraduates. *Int J STD AIDS* 2004; 15: 467–72. doi:10.1258/0956462041211207

7 Yarber WL, Crosby RA, Graham CA, Sanders SA, Arno J, Hartzell RM, McBride KR, Milhausen RR, Brown L, Legocki LJ, Payne M, Rothring A. Correlates of putting condoms on after sex has begun and of removing them before sex ends: a study of men attending an urban public STD clinic. *Am J Men Health* 2007; 1: 190–6. doi:10.1177/1557988307301276

8 Crosby RA, Yarber WL, Graham CA, Sanders SA. Does it fit okay? Problems with condom use as a function of self-reported poor fit. *Sex Transm Infect* 2010; 86: 36–8. doi:10.1136/sti.2009.036665

9 Graham CA, Crosby RA, Sanders SA, Milhausen RR, Yarber WL. Condom-associated erection problems: a study of high-risk young Black males residing in the southern United States. *Am J Men Health* 2015. doi:10.1177/1557988314561311

10 Crosby RA, Charnigo RJ, Shrier LA. Condom-use errors and problems among teens attending clinics: better or worse than young adults? *Open Access J Contracept* 2012; 3: 17–22. doi:10.2147/OAJC.S26440

11 Fortenberry JD, Tu W, Harezlak J, Katz BP, Orr DP. Condom use as a function of time in new and established adolescent sexual relationships. *Am J Public Health* 2002; 92: 211–3. doi:10.2105/AJPH.92.2.211

12 Hill BJ, Janssen E, Kvam P, Amick EE, Sanders SA. The effect of condoms on penile vibrotactile sensitivity thresholds in young, heterosexual men. *J Sex Med* 2014; 11: 102–6. doi:10.1111/jsm.12362

13 Janssen E, Sanders SA, Hill BJ, Amick E, Oversen D, Kvam P, Ingelhart K. Patterns of sexual arousal in young, heterosexual men who experience condom-associated erection problems (CAEP). *J Sex Med* 2014; 11: 2285–91. doi:10.1111/jsm.12548

14 Napper LE, Fisher DG, Reynolds GL, Johnson ME. HIV risk behavior self-report reliability at different recall periods. *AIDS Behav* 2010; 14: 152–61. doi:10.1007/s10461-009-9575-5

15 Yates F. Contingency table involving small numbers and the χ^2 test. *Suppl J Royal Stat Soc* 1934; 1: 217–35. doi:10.2307/2983604

16 Maticka-Tyndale E. Sexual scripts and AIDS prevention: variations in adherence to safer-sex guidelines by heterosexual adolescents. *J Sex Res* 1991; 28: 45–66. doi:10.1080/00224499109551594

17 Milhausen RR, Wood J, Sanders SA, Crosby RA, Yarber WL, Graham CA. A novel, self-guided, home-based intervention to promote condom use. *J Men's Health* 2011; 8: 274–81. doi:10.1016/j.jomh.2011.06.003

18 Emetu RE, Marshall A, Sanders SA, Yarber WL, Milhausen RR, Crosby RA, Graham CA. A novel, self-guided home-based intervention to improve condom use among young men who have sex with men. *Am J Coll Health* 2014; 62: 118–24. doi:10.1080/07448481.2013.856914

19 George WH, Davis KC, Norris J, Heiman JR, Schacht RL, Stoner SA, Kajumulo KF. Alcohol and erectile response: the effects of high dosage in the context of demands to maximize sexual arousal. *Exp Clin Psychopharmacol* 2006; 14: 461–70. doi:10.1037/1064-1297.14.4.461

20 Crosby RA, Milhausen RR, Sanders SA, Graham CA, Yarber WL. Being drunk and high during sex is not associated with condom use behaviors: a study of high-risk young Black males. *Sex Health* 2014; 11: 84–6. doi:10.1071/SH13181

21 Crosby RA, Graham CA, Yarber WL, Sanders SA. Problems with condoms may be reduced for men taking ample time to apply them. *Sex Health* 2010; 7: 66–70. doi:10.1071/SH09020